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Final Report

Project Title:

Keeping Fit and Fit to Drive: An Experimental Intervention to Explore the Impact of Physical Exercise on Older Adults' Driving

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Project Description

With the aging of the population has come increased attention to the importance of helping older adults retain their mobility. For many older adults, driving is central to their senses of identity and autonomy, and some research has shown that driving cessation among older adults is associated with depression. Yet much work on driving among older adults has focused on this issue of driving self-regulation or driving cessation. Much less work has addressed the issue of older adults' driving from the perspective of what strategies might help to keep older adults driving safely. The purpose of this research was to conduct an experimental intervention to examine the impact of physical exercise on older adults' safe driving behaviors.

The purpose of this research was to approach the question of mobility for older adults from a positive perspective: rather than focus on the negative of stopping a behavior, the question was what older adults might be able to do proactively to extend their safe driving careers. A few studies have shown that physical activity might have a positive impact on safe driving behaviors among older adults (e.g., Marmeira, Godhino and Fernandes 2009; Marmeira et al. 2011; Marottoli et al. 2007; Ostrow, Shaffron and McPherson 1992). Maintaining different elements of fitness may be important for continued safe driving behavior. For example, Staplin et al. (2003a, 2003b) found an increase in crash risk among drivers who failed a head and neck rotation task. Thus, maintaining flexibility as part of a fitness routine may be important for helping older drivers to continue to drive safely. To explore further how positive action might help to extend driving, this study was designed as an experimental intervention to examine the impact of physical exercise on older adults' safe driving behaviors.

Methodology

This study used a pre-test post-test control group design employing an intervention with widely commercially available physical fitness program and equipment – the Microsoft Xbox and Kinect systems using EA Active Sports 2 – that could be used by older adults in their home to examine the impact of physical fitness on driving behavior. Participants in this study were community-dwelling drivers ages 60 to 74 recruited from eastern Massachusetts; 46 completed both the pre- and post-tests. They did not report any significant health conditions that might preclude them from taking part in an exercise program. They were assigned to study condition randomly once they were matched for gender and amount of self-reported exercise. During the pre-test, participants completed questionnaires to collect measures of driving history and driving behavior, demographics and health and fitness behaviors, as well as the Montreal Cognitive Assessment (MOCA) and the Geriatric Depression Scale (GDS). They also completed a UFOV test and Trails. In the lab they did several tests to assess physical function, their ease of getting in and out of the driving simulator, their torso rotational flexibility while in the simulator, and a reaction time test during a simulated drive.

Following the pre-test, subjects were assigned to either the intervention or control condition at random, matching for age and self-reported fitness behaviors. The intervention group was asked to exercise using the Microsoft Xbox and Kinect system. Exercises were selected from the EA Active Sports 2 package by an expert with experience in designing functional exercise routines for older adults. Participants were instructed to try to do one of the two routines, lasting 15 to 20 minutes, on a daily basis. Eight to 10 weeks following the pre-test all participants were invited to return to the lab for a post-test visit. Once again, participants completed written questionnaires, including measures of the DBQ, MOCA and GDS. They repeated the same physical in-lab tests as well as the reaction time protocol in the driving simulator. Following in-lab data collection, participants were asked to drive the instrumented AgeLab Aware Car on a pre-determined route. While they drove, participants' degree of rotation to look right when

making turns and changing lanes was captured. Participants were also asked to reverse the vehicle so that their degree of rotation in looking behind them was measured.

Findings

Few significant differences emerged on many of the key variables in the study, although there were several findings of note:

- The intervention group was faster to enter the vehicle in the post-test relative to the controls. On the ingress task, the intervention group improved their performance relative to the control group. On average, participants in the intervention group were 3.6 seconds faster to enter the vehicle in the post-test, compared to 1.88 seconds faster for controls ($F(1,45)=4.399, p=.042$).
- There was a significant difference in rotational degree for the first two right hand turns done in the on-road vehicle, with the experimental group rotating further. This may not simply be an artifact, as the control group may have needed the first two turns to warm up before they could match the degree of rotation among the intervention group. For the first two right hand turns the experimental group rotated further than the control group (control group $M=52.766, SD=16.638$; intervention group $M=61.512, SD=7.99$; $F(1,39)=4.336, p=.044$).
- There was a significant difference between control and experimental participants in terms of how easy they found it to rotate their torso to look behind them as if they were going to back up in the simulator. Relative to the pre-test, experimental participants were more likely to report that rotating was easier than in the pre-test.
- Condition and use of the Kinect were significant predictors of reports of how easy or difficult people found it to see their right blind spot as they changed lanes. Participants in the exercise condition in the post-test were on average more likely to say it was easier.

Conclusions

Although the results from the intervention study fell short of the expectations, there are several possible explanations which point to the need for and direction of future studies. First, although the study intent was to use a widely available and accessible fitness program, the Xbox and Kinect system with the EA Active Sports 2 program may not have been sufficient to engender differences in driving behavior. Participants may not have done the exercises correctly or at the intensity required in order to experience any improvement. The eight to 10 week intervention may not have been long enough to show an effect. Second, the study population may have been too fit. This group may have been too healthy such that the exercise intervention made little difference in their physical fitness. In spite of these limitations, there were some positive impacts of taking part in the exercise program for intervention participants; as such, the need for additional research on this topic is pressing.

Outputs

Results from this research are being prepared for publication submission. At this time two outlets are being considered: the 2014 Transportation Research Board meeting or a submission to *Physical Therapy Journal*. In addition, The Hartford has posted the key results from the study on their website (<http://www.thehartford.com/mature-market-excellence/exercise-for-mature-drivers>) and created short video clips of the different exercises that will be made available to the public on their website and Facebook pages In June and July 2013.